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FOUR-NINE STORY LARGE-UNIT APARTMENT BUILDINGS (4-9-ETAZHRYE ZH--ETC(U)
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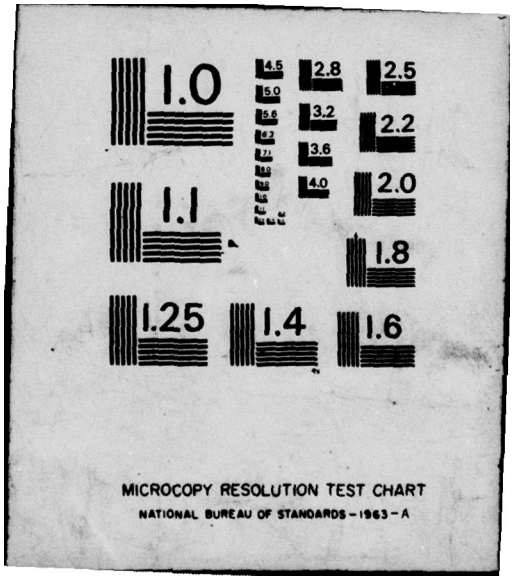
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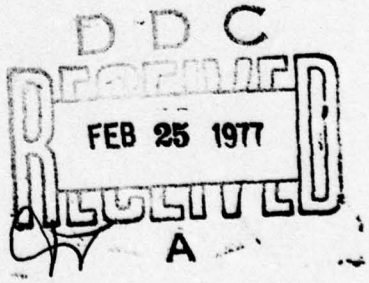
Draft Translation 575
December 1976

FOUR TO NINE STORY LARGE-UNIT APARTMENT BUILDINGS



CORPS OF ENGINEERS, U.S. ARMY
COLD REGIONS RESEARCH AND ENGINEERING LABORATORY
HANOVER, NEW HAMPSHIRE

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PREFABRICATION
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20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

The projects of a plant for large-unit prefabricated building construction and for four- to nine-story apartment buildings for Noril'sk have been developed at LenZNIIEP. Development of this type of construction at Noril'sk is one of the first experiments to introduce prefabricated housing construction under the severe conditions of the Arctic, which presumes, besides further industrialization, a considerable improvement in the quality of construction, reduction of the periods for erecting buildings and improvement → next page

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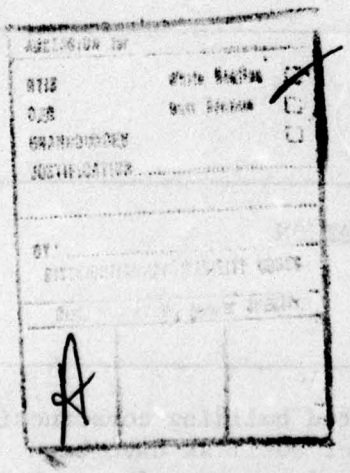

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AB

FOUR- TO NINE-STOREY LARGE-UNIT APARTMENT BUILDINGS

The projects of a plant for large-unit prefabricated building construction and for four- to nine-storey apartment buildings for Noril'sk have been developed at LenZNIIEP. Development of this type of construction at Noril'sk is one of the first experiments to introduce prefabricated housing construction under the severe conditions of the Arctic, which presumes, besides further industrialization, a considerable improvement in the quality of construction, reduction of the periods for erecting buildings and improvement of working conditions.

The four- to nine-storey apartment buildings were developed at the contract design stage and the sectional-block method of design was used in this case. Along with sectional blocks, a number of representative buildings which reveal the common nature of the series is represented.

Nomenclature of Sectional Blocks

(1) № п/п	(2) Марка жилой секции	Этажность	(3) Эскиз (4) (5)	К-во квартир всего	1 комн.	2 комн.	3 комн.	4 комн.	(6) Площадь застроенная м²	(7) Строительный объем здания м³	(8) Полезная площадь м²	(9) Жилая площадь м²	(10) К.	(11) Коэффициенты
1	51-9м	9	14190	36	-	-	9	-	332	9167	1255	2157	0,58	7,30
			25730		9	9	-	9		9921				7,90
2	52-9м	9	14190	36		-	9	-	371	10230	1434	2401	0,59	7,13
			26730			9	9	9		11068				7,72
3	53-9м	9	14190	36	-	-	-		312	8611	1112	1961	0,57	7,74
			22800		9	18	9			9323				8,39
4	54-9м	9	14190	72	18	-	18		528	14583	1919	3459	0,55	7,59
			37530		18	18	-			15757				8,20
5	55-9м	9	14190	72	18	18			469	12962	1609	3028	0,53	8,05
			33600		36	-				14009				8,70
6	56-9м	9	12960	27		9		9	255	7047	943	1556	0,60	7,47
			20730			9		-		7635				8,09
7	57-9м	9	12960	36	9	9	-		296	8177	1045	1826	0,57	7,82
			23400		-	9	9			8853				8,47
8	58-9м	9	12960	54	18	9	9	9	429	11823	1570	2680	0,58	7,53
			33230		-	9	-	-		12803				8,15
										11893	1593	2703	0,59	7,46
										12873				8,08

Table continued on following page

Table continued

(1) № п/п	(2) Марка блок-секции	(3) Этажн.	(4) Эскиз	(5) К-во квартир: (6) всего	1 А/Б	2 А/Б	3 А/Б	4 А/Б	(7) Площадь застройки, м²	(8) Строит. объём выше ±0/общий	(9) Жилая площадь, м²	(10) Полезная площадь, м²	K₁	(11) K₂ выше/общий
9	Б9-9м Ф	9	2Б 1А 1А 2Б / 3А 3А; 12660; 33600	54	18 / –	– / 18	18 / –		425	11708 / 12658	1535	2677	0.57	7.02 / 8.24
										11779 / 12729	1559	2701	0.58	7.89 / 8.16
10	Б10-9м	9	3А 3А / 2Б 4Б; 16860; 24360; 31660	36		– / 9	18 / –	– / 9	365	10088 / 10912	1439	2361	0.61	7.01 / 7.57
				36			18 / –	– / 18	392	10786 / 11668	1577	2351	0.61	6.84 / 7.39
11	Б11-Ул	9	2Б / 2Б 3А / 3Б; 20730; 25730	36		– / 18	9 / –		352	9702 / 10498	1299	2230	0.58	7.47 / 8.08
12	Б12-4м Шл	4	1А 3Б / 2А; 12660; 19830	12		4 / –	– / 4	4 / –	251	3100 / 3669	466	755	0.62	6.64 / 7.86
13	Б13-4м Ф	4	3Б 3Б / 2А 1А; 12660; 22800	16	4 / –	4 / –	– / 8		289	3565 / 4214	511	876	0.58	6.97 / 8.23
14	Б14-4м Шл	4	1А 1А 1А 2Б / 2А 2Б; 12660; 30330	24	8 / –	4 / 8		4 / –	384	4742 / 5596	661	1134	0.58	7.17 / 8.47
15	Б15-4м Ф	4	2Б 1А 1А 2Б / 2Б 3А; 12660; 30300	24	8 / –	– / 12	4 / –		383	4737 / 5591	645	1133	0.57	7.33 / 8.66
16	Б16-4Ул	4	2Б / 2Б 3А / 3Б; 20730; 25300	16		– / 8	4 / 4		352	4347 / 5133	577	991	0.56	7.53 / 8.89

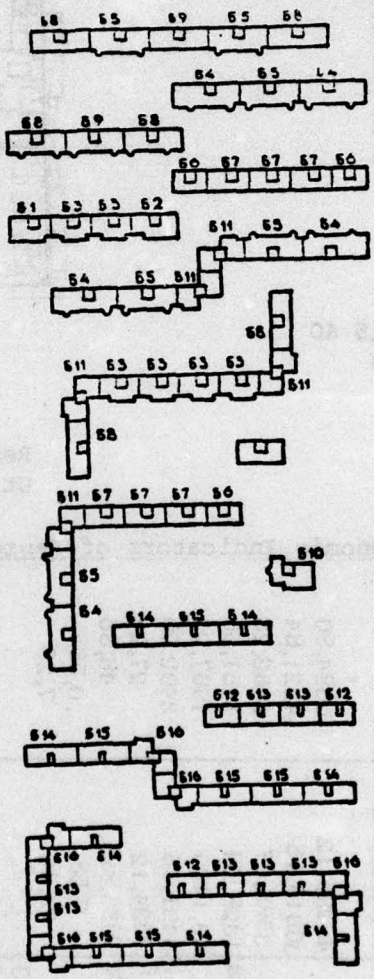
KEY:

1. No. of item
2. Mark of sectional block
3. Number of stories
4. Layout
5. Number of apartments
6. total
7. Area of construction site, m²
8. Construction volume, above ±0.00/total
9. Residential area, m²
10. Utility area, m²
11. Above ±0.0/total

The nomenclature of the sectional blocks includes 17 end, row and angular sections and localized type buildings (not counting mirror solutions) which provide formation of the quarters and microrayons of the town with regard to urban planning requirements required for construction conditions in the climate-construction zone No. 1. The nomenclature includes four- and nine-storey, latitudinal and meridional sections which include 17 types of apartments.

The architectural-layout solution of the series of sectional blocks provides: variety of volume-compositional solutions of the apartment buildings of different width, expanse, configuration and number of stories; flexibility of the architectural-plastic solutions of the facades due to balconies, suspended

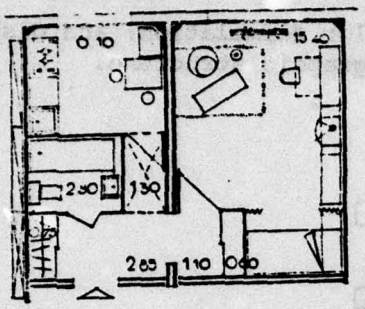
enclosing panels different in shape and their color formulation; and dispersion of the population over a wide range of demographic structure.



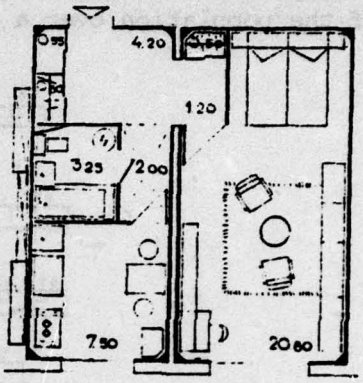
Possible Variants of Sectional-Block Combinations

The apartment layout in the series was developed according to the new edition of SNiP "Residential buildings," which provides an increase of the apartment utility area by 10 percent, an increase in the height of stories to 3.0 m and equipping the apartment buildings with ventilation with air heating and cooling for construction-climatic regions No. 1.

Clear zoning of spaces according to functional needs is provided in apartments of all types, with the exception of one-room and some two-room apartments. All the apartments are designed without through rooms. The sanitary facilities in all apartments, with the exception of one-room apartments, are separate and their overall dimensions make it possible to place a washing machine and additional equipment in them in addition to the sanitary equipment.



Residential area 15 40
Utility area 30 90



Residential area 20 80
Utility area 41 90

Technical and Economic Indicators of Representative Buildings

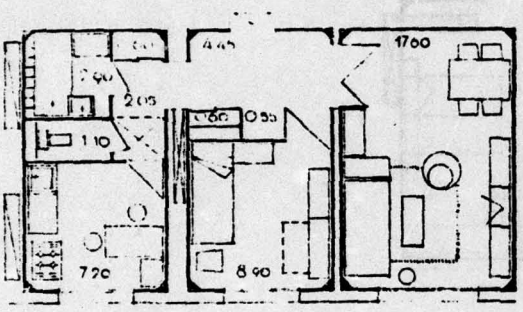
Технико-экономические показатели домов-представителей	4-секционный 9-этажный (2)	3-секционный 4-этажный (3)
Показатели (1)		
Строительный объем, м³ (4) (5)	40205,12	18684,90
общий, м³		
надземной части (6)	36819,15	14221,84
подземной части (7)	3585,97	2463,28
Площадь застройки, м² (8)	1328,01	1151,55
Жилая площадь, м² (9)	49,1400	1967,20
Полезная площадь, м² (10)	9481,15	3402,20
Средняя жил. 5 кварт., м² (11)	1134,12	27,21
-"- полезн. 5 кварт., м² (12)	2158,89	46,85
K_1	0,58	0,58
K_2	7,45	7,25
Базисная стоимость (13)		
1 м² полезной площади	112	124,48
в руб.		
Тоже 1 м² жилой пл. (14)	193,3	214,94
Трудозатраты на 1 м² (15)		
жилой площади в ч/дн.		
а) на заводе (16)	3,29	3,66
б) на строительстве (17)	0,94	1,07

KEY:

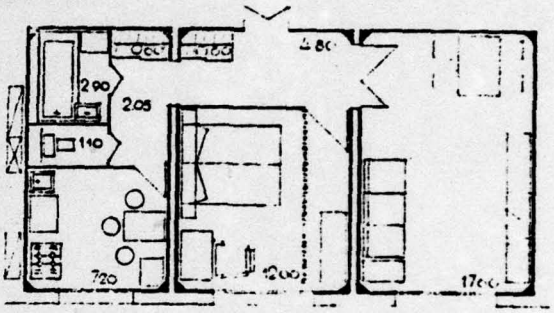
1. Indicators
2. Four-section nine-storey
3. Three-section four-storey
4. Construction volume
5. total, m^3
6. aboveground part

(Key continued on following page)

7. below ground part
8. Area of construction site, m^2
9. Residential area, m^2
10. Utility area, m^2
11. Average residential area S of apartments, m^2
12. Average utility area of apartments S, m^2
13. Base cost of 1 m^2 of utility area in rubles
14. Base cost of 1 m^2 of residential area
15. Labor expenditures per 1 m^2 of residential area in man-days
16. at the plant
17. on construction



Residential area 26 50
Utility area 45 85



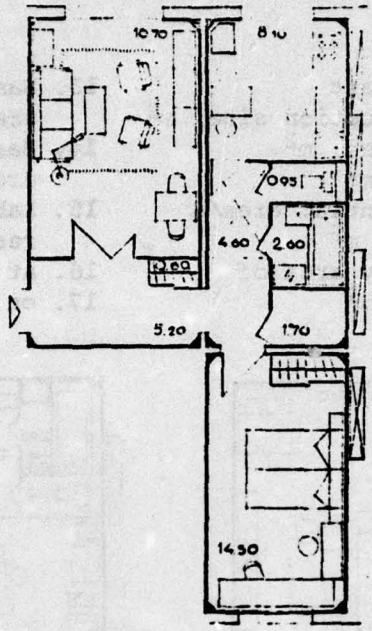
Residential area 29 60
Utility area 48 85

Ventilated drying cabinets are arranged in the entrance halls. The kitchens, depending on the type of apartments, occupy an area from 6 to 10.5 square meters and are equipped with a sink, electric stove and refrigerating cabinet with natural air exchange. Each sectional block of the four- and nine-storey buildings is equipped with a trash chute. The entrance in the sections is considerably developed and includes a double vestibule, a small vestibule and a pram space.

Five standard dimensions of 3.6-3.0-2.7 by 6.9 m and 3.6-3.0 by 5.4 m are used for the room blocks in the series. The maximum weight of the room block is 17 tons.

The characteristic design feature in assembly of the buildings is support of the room blocks by special asbestos board interlayers on four assemblies, which determines the most economic solution of the foundations by installation of single pilings at points where the longitudinal and transverse axes intersect and also eliminates the need to use mortar.

The room blocks are delivered for assembly with maximum possible plant readiness, including finishing, installation of all bathroom equipment, heating pipes, water pipes, sewer lines and electric wiring. Only floor by floor connection of all systems is accomplished during installation.



Residential area 31 10
Utility area 54 85

(1) НАИМЕНОВАНИЕ ПОМЕЩЕНИЙ (2)	ТИПЫ КВАРТИР (3)																													
	1А		1Б		2А		2Б									3А						3Б		4А		4Б				
	А'	А"	Б' (4)	Б"	А'	А"	Б' (4)	Б"	Б"	Б" (5)	Б"	Б"	А' (6)	А"	А"	А"	А"	А"	Б'	Б"	Б"	А'	Б'	Б"	А'	Б'	Б"			
ОБЩАЯ КОМНАТА (7)	15.40	15.00	20.80	22.10	17.00	18.90	16.70	16.70	16.70	17.60	17.10	16.70	16.70	18.00	18.00	17.00	18.90	17.00	17.40	17.40	18.60	17.00	18.60	18.60						
СПАЛЬНЯ НА ДВОИХ (8)	—	—	—	—	—	—	14.40	13.40	14.40	12.00	13.10	15.00	13.00	13.00	13.00	13.00	13.00	13.75	12.10	14.40	15.00	13.00	13.00	13.00						
СПАЛЬНЯ НА ДВОИХ (8)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	11.10	11.10	—	—	9.30	9.50						
СПАЛЬНЯ НА ОДНОГО (9)	—	—	—	—	8.90	8.90	—	—	—	—	—	—	8.80	8.90	8.80	8.20	8.20	8.08	—	—	8.20	8.80	7.80	7.80						
СПАЛЬНЯ НА ОДНОГО (9)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	7.80	—	—						
ЖИЛАЯ ПЛОЩАДЬ (10)	15.40	15.00	20.80	22.10	26.90	27.80	31.10	30.10	31.10	29.60	32.20	31.75	33.30	39.80	39.80	38.20	40.10	39.40	40.60	42.90	32.20	47.20	49.10	49.10						
КУХНЯ (11)	6.10	6.10	7.30	7.30	7.20	7.20	8.10	8.10	8.10	7.20	8.10	7.90	8.10	8.10	8.10	8.45	8.45	8.45	8.60	8.60	8.95	8.40	8.30	8.95						
САНИТАРНЫЙ УЗЕЛ (12)	2.80	2.80	3.25	3.25	4.00	4.00	3.55	3.55	3.55	4.00	3.55	3.55	3.55	3.55	3.55	3.70	3.70	3.70	3.55	3.55	3.70	3.55	3.55	3.55						
ПЕРЕДНЯЯ С КОРИДОРОМ (13)	3.25	3.55	7.40	7.40	6.50	6.50	9.30	10.55	8.65	6.85	9.05	10.30	11.40	11.40	13.35	10.75	10.75	10.75	12.35	12.25	13.95	10.90	16.60	13.05						
СУШИЛЬНЫЙ ШКАФ (14)	0.75	0.80	0.00	0.00	0.00	0.00	0.00	0.70	0.70	0.00	0.00	0.00	0.95	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00						
ВСТРОЕННЫЕ ШКАФЫ И КЛАДОВАЯ (15)	0.00	0.00	1.05	1.05	1.05	1.05	1.70	1.90	1.40	0.00	2.75	1.05	1.30	1.05	2.30	0.70	0.70	1.05	2.30	2.85	2.15	2.15	1.50	1.10						
ПОДСОБНАЯ ПЛОЩАДЬ (16)	10.30	10.85	19.80	19.80	19.35	19.35	23.25	23.10	22.40	19.25	24.05	24.05	24.95	25.30	27.90	20.20	20.20	20.20	25.15	27.10	27.85	29.35	25.00	22.35	19.25					
ПОЛЕЗНАЯ ПЛОЩАДЬ (17)	30.90	31.45	41.90	41.90	45.85	47.15	54.35	53.25	53.50	48.85	56.25	55.80	58.05	65.10	67.70	65.00	66.30	64.55	65.75	70.00	60.15	76.40	74.50	71.85	68.35					

Notes: 1. The types of apartments in sectional blocks for row buildings are denoted by the letters A and B with ordinal indexes.

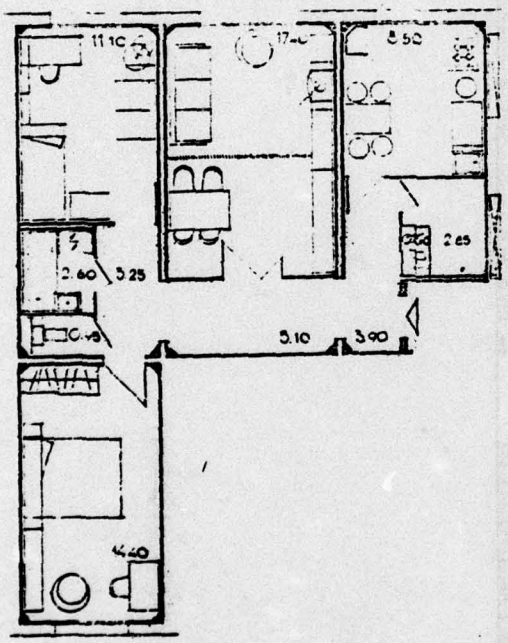
2. Addition to the letter notation "the same with balcony" means that this is a version of the previous apartment layout with a balcony in the common room.

(Notes continued on following page)

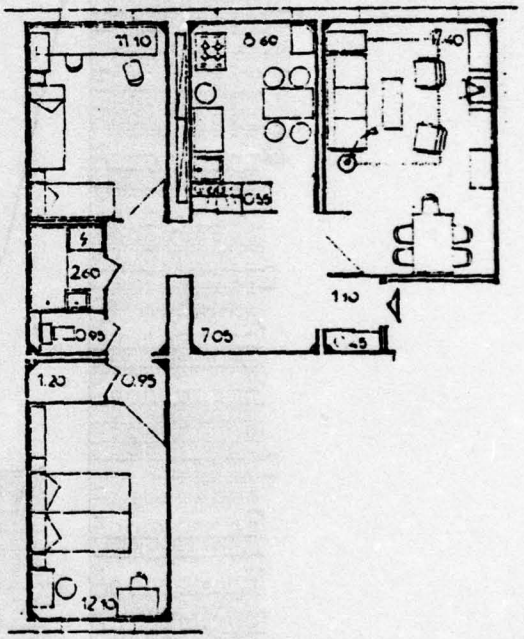
3. Other additions to the letter index denote types of apartments in sections of localized angular buildings.

KEY:

1. No. of item
2. Name of spaces
3. Types of apartments
4. the same with balcony
5. in localized building
6. in angular section
7. Common room
8. Double bedroom
9. Single bedroom
10. Living area
11. Kitchen
12. Bathroom
13. Vestibule with corridor
14. Drying cabinet
15. Built-in cabinets and pantry
16. Auxiliary space
17. Utility area



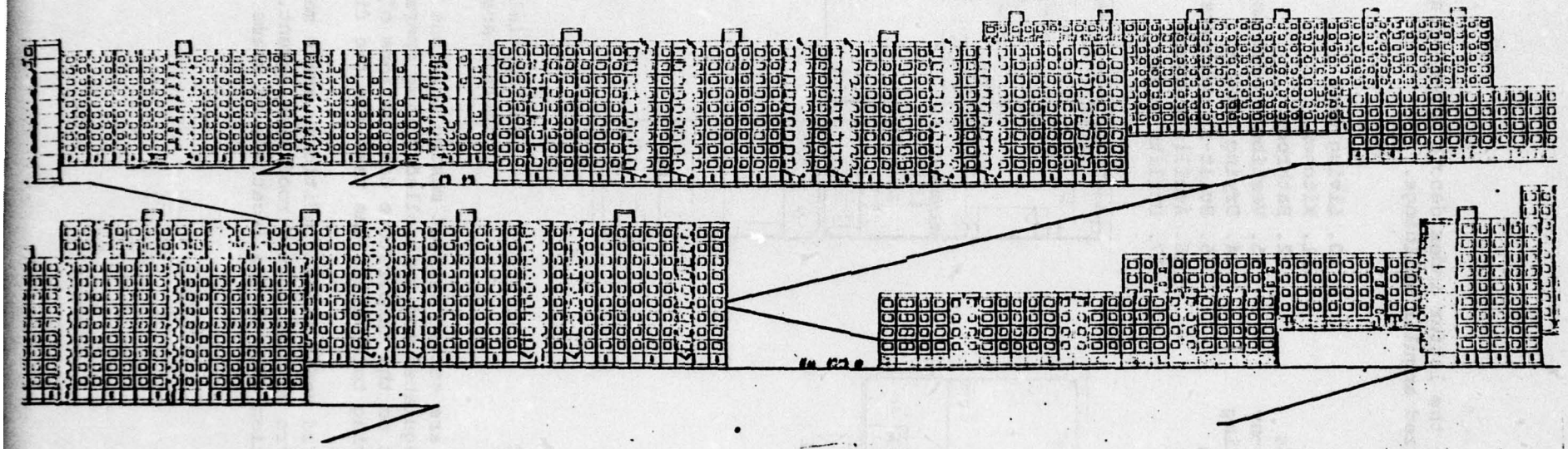
Residential area 40 60
Utility area 67 70



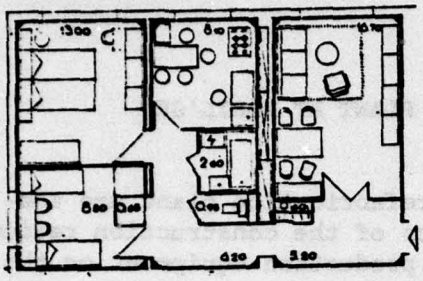
Residential area 42 20
Utility area 70 75

All the outside wall seams are solved without making them one piece. The stressed vertical joint, regulated and controlled during operation of the buildings and not dependent on the temperature deformations of the walls, installation and manufacturing tolerances, was used for the first time.

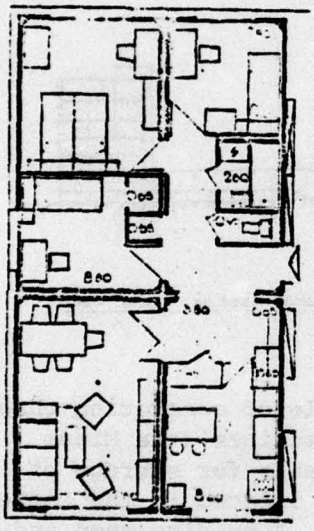
The roof is also manufactured under plant conditions, where mastic layers reinforced with fiberglas are applied to the roof overlayment. The roofing is applied during installation only at the locations of seams of different abutments.



The window openings are used with triple glazing.

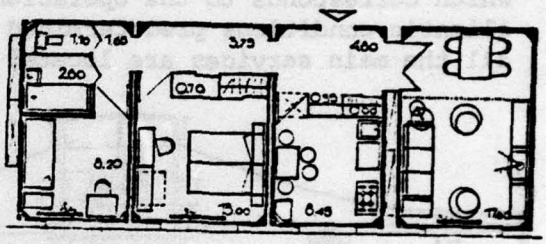


Residential area 38 50
Utility area 63 45

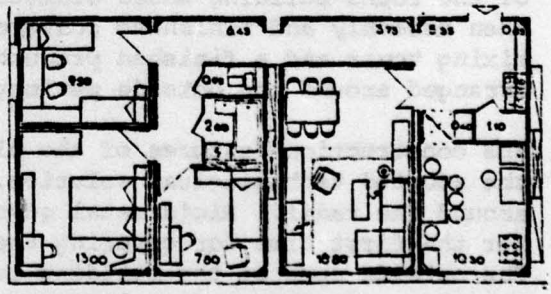


Residential area 47 20
Utility area 72 80

Residential area 38 80
Utility area 65 00

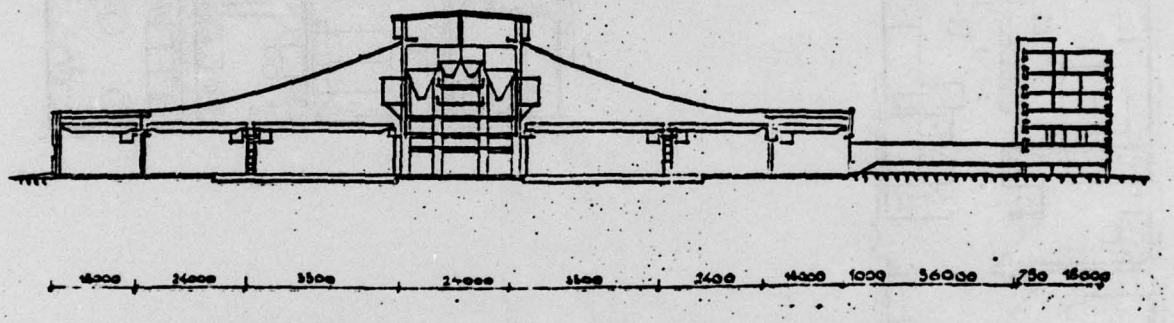


Residential area 49 10
Utility area 81 65



LARGE-UNIT DWELLING PREFABRICATION PLANT AT NORIL'SK

The bases in design of a large-unit dwelling prefabrication plant are the principles which take into account the specifics of the construction region on the one hand and intelligent arrangement of production equipment on the other. The possibilities of a local construction base determined development of a plant variant from prefabricated steel sections delivered from developed regions of the country. The desire to produce a plant design which corresponds to the operational characteristics under severe natural climatic conditions predetermined development of a compact solution where all the main services are located in the same building.



The technological basis of the plant is the principle of concreting three-dimensional blocks of the "dome" type in cassette machines (the Minsk technique). A concrete mixing assembly tower and tanks for storage of a 6-day reserve of inert ingredients and cement are located in the center of the round building whose diameter is 174 meters. A molding shop and then assembly and finishing conveyors are arranged around the concrete mixing tower and a finished products warehouse and auxiliary shops are arranged around the outside perimeter.

The construction features of the plant design are organically combined with the adopted technological solution. The supporting structures are arranged around the radii. Rigid metal guys secured to the support ends were used for the first time for covering the middle span (57 m) of the plant building. The outside span of the building is covered with an ordinary beam system. All the supporting and enclosing structures of the plant are designed as prefabricated and their installation includes wet assembly processes. The outside walls are made of aluminum panels with efficient insulation and the roofing is made from stamped steel box overlayment also with efficient insulation.

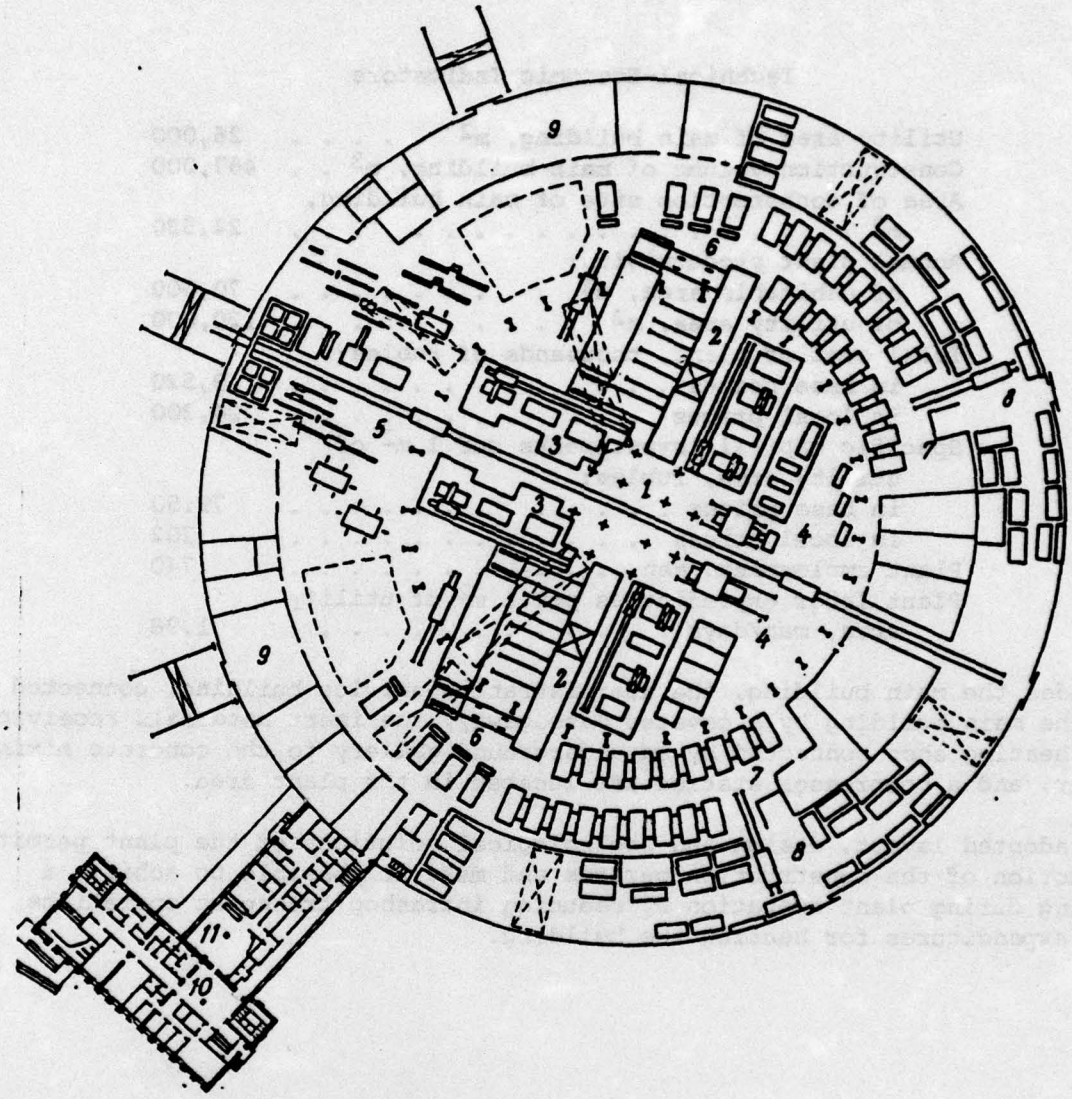
All the working and auxiliary sections of the plant are equipped with overhead travelling cranes which move along circular rails.

Technical-Economic Indicators

Utility area of main building, m^2	26,000
Construction volume of main building, m^3	467,000
Area of construction site of main building, m^2	24,530
Annual plant productivity:	
of habitable area, m^2	70,000
of utility area, m^2	120,000
Total cost of plant, thousands of rubles:	
in base prices	9,520
in local prices	24,300
Specific capital investiments per 1 m^2 of utility area, rubles:	
in base prices	79.50
in local prices	202
Plant employment, men	740
Plant labor expenditures per 1 m^2 of utility area, man/days	1.98

Besides the main building, the administrative-service building, connected to the main building by a covered passageway, the inert materials receiving and heating shop connected by an underground gallery to the concrete mixing tower, and a compressor station are located in the plant area.

The adopted layout, design and technological solutions of the plant permit reduction of the construction periods and make it possible to achieve a saving during plant operation by reducing intrashop transport operations and expenditures for heating the building.



1. Concrete mixing section
2. Molding machines for three-dimensional blocks
3. Cassette machines
4. Molding section for prefabricated articles
5. Reinforcement shop
6. Prefabricated three-dimensional block section
7. Conveyor for finishing three-dimensional blocks
8. Finished products warehouse
9. Auxiliary sections, shops and warehouses
10. Administrative-service building
11. Passageway